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Arizona's Crucible: Water Management in the 21st Century

By
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In 1987, the Arizona State University History Department, under the leadership of Noel Stowe, brought together a group of historians to explore various issues of importance to the State of Arizona, as it celebrated its 75th birthday, and pose key questions for the next 25 years leading to its centennial. In a piece entitled "Water, Water Everywhere, Nor. . ." I examined Arizona's water history, and its then "contemporary", now historic, water management and water quality situation, with an eye toward the future.

Today, I want to pick up where we left off when last we talked about Arizona's water history. In 1987, the Central Arizona Project (CAP) was still under construction, but had begun water deliveries in 1985 and we thought it would supply more than enough water to meet our needs well into 2012. In fact, we were concerned we would not use enough of Arizona's allocation of the Colorado River, and find ourselves losing some portion of it to California. The Groundwater Management Act had been in place for just a few years, and we were confident that its water conservation requirements would reduce our over-reliance on groundwater pumping. In the two largest metropolitan communities, Phoenix and Tucson, discoveries of widespread groundwater contamination due to industrial discharges and agricultural application of pesticides, caused many to worry about water quality, risks to public health and whether we would be able to use the groundwater available, even if we could reduce our pumping. The Environmental Quality Act, just

passed in 1986, promised to be the answer for Arizona's then deteriorating water quality, keeping us from the fateful prophecy of the *Rime of the Ancient Mariner:* "water, water, everywhere,/Nor any drop to drink."

The population in 1987 was approximately 3.5 million, and in Maricopa and Pima counties, where about 75% of the people live, it was 2.8 million people. Groundwater pumped in the Active Management Areas (AMAs) at that time totaled about 3 million acre-feet; pumping for the rest of the state, not regulated by the Groundwater Management Act, was about half that amount.[1] The CAP, designed to deliver an annual average supply of 1.5 million acre-feet, delivered in 1987 only 355,000 acre-feet of water. About 6.6 million acre-feet of water were used throughout the state, and agriculture took about 80% of it, with municipal and industrial uses consuming the rest.[2] An acre-foot of surface water from SRP cost about $10, of groundwater about $35, and of CAP water for M&I uses, about $42. An acre-foot of water is approximately 326,000 gallons or enough to sustain a family of 5 for one year. By way of reference, a gallon of gasoline cost $0.95 in 1987.

Despite the large amount of CAP water available, we worried about having enough water to sustain growth. The 1987 landscape was filled with talk of water marketing to allow water to meet its highest and best use, which clearly meant it would become a lot more expensive; water augmentation through cloud seeding; experimenting with groundwater

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[1] Arizona Department of Economic Security, "Intercensal Population of Counties," accessed at www.de.state.az.us/links/economic/webpage/popweb/betty70-99.html, September 19, 2002; Bruce A. Wright, ed., Ensuring Arizona's Water Quantity and Quality into the 21st Century, (Phoenix: Arizona Town Hall, 1997), pp. 49, 59.

[2] Wright, ed., Ensuring Arizona's Water, pp. 40, 47.

recharge; the pace of urbanization of agricultural lands, and whether it would come in time; and the unknown factor of the General Stream Adjudications and Indian water rights claims that left the water world always uncertain about reliable supplies.

My 1987 predictions for the next 25 years were these: we would be slow to use our full supply of the CAP; the price of water would increase substantially; water conservation would take hold and be meaningful; water marketing would occur; recharge of water would provide an opportunity to store vast quantities of water; water management and planning would improve significantly; water quality would improve; and we would need to prepare for a different environment where the problems weren't basic water supply, but ensuring water quality and an efficient allocation of water resources.

While we are not quite at our 25-year marker of 2012, we are close enough to see whether these predictions will be correct.

In 2006, Arizona's population is about 6 million. Our growth rate either leads the nation or comes in second to Nevada, depending upon which statistical source you use. Construction, always a major industry in Arizona, accounts for more than $12 billion of our state's economy. Agriculture and mining continue to decline as drivers of Arizona's economy, their combined contribution to the state's gross state product at just 2%, or $3.3 billion. Our economy is a services economy, fueled in large part by real estate, with a new, sharpened focus on health and medical services, including world-class research institutes. Yet our state water budget still reflects the old economy: we use nearly 8

million acre-feet of water and about 75% of it goes to agriculture. The price of water today? An acre-foot of water from the SRP is about $11, of groundwater about $38, and from the CAP for M&I is $106. [3] A gallon of gasoline? In my neighborhood, it's $2.39 a gallon.

In 1987, we wondered about the impact of the General Streams Adjudication. The significant tribal claims to water in the state, in fact, claims for more water than existed, created a sense of uncertainty about future supplies. Since that time, we have settled 8 tribal claims, with the most recent and substantial settlement for the Gila River Indian Community; 5 tribes are in negotiations to settle claims; and 6 small tribes have not begun settlement discussions. Despite the fact that in 30 years we have not "adjudicated" a single right to use surface water from our non-Colorado River supplies, these tribal water settlements and ensuing municipal long-term water contracts with the tribes, have served to create a climate of certainty, at least about the impact of the Adjudication as it relates to tribal claims.[4]

That's the good news about the Adjudication. The bad news is that we have not settled a single claim, other than tribal claims. Granted, these are the most significant claims in terms of amounts of water. But in places like the Verde and the San Pedro river basins,

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[3] Bureau of Economic Analysis, U.S. Department of Commerce, www.bea.gov/bea/newsreel/gspnewsrelease.; Center for Business Research, L. William Seidman Research Institute, College of Business, Arizona State University, "Arizona Economic Profile November 2002", p.24, accessed www.azcommerce.com/prop/eir/economy.asp, February 23, 2006; Herb Guenther, "Arizona Water Issues: Congressional Briefing", December 20, 2005, possession of author; Summary SRP Water Allocation and Water Fees for 2006, accessed www.srpnet.com/water/irrigation/pdfx/pricesummary06.pdf, February 24, 2006 and Central Arizona Project, Final 2006 Water Rate Schedule, accessed www.cap-az.com/management/index.cfm?action=rates&subSection=11, accessed February 24, 2006.

[4] Gregg Houtz to Karen Smith, email dated 24 February 2006, in author's files.

the uncertainty and legal tension surrounding competing claims to use those waters jeopardizes sound planning and development. And with the Navajo and Apache claims still outstanding, much work remains. Still, progress is being made in the legal arena, as the courts gradually finalize the decision-making framework by which these claims will be settled. We have finally resolved, for example, how to determine whether one is pumping groundwater or surface water. This is a critical decision that the court has made and will allow the Department of Water Resources to begin its mapping of the subflow zones adjacent to Arizona's rivers and streams.[5]

If the Adjudication and its tribal water settlements have created a perception of certainty surrounding the rights to use the surface waters of our state, recent negotiations among the 7 Basin states have solidified Arizona's allocation of 2.8 million acre-feet of Colorado River water, and reduced the risk of the state suffering dramatic shortages when supplies are low. Arizona, as you may know, litigated its right to the Colorado River with California, and the resulting United States Supreme Court decree in 1964 gave Arizona the right to use the 2.8 million acre-feet of water BUT with a junior priority: when the Colorado produces less than what is allocated among the 3 Lower Basin states, Arizona will suffer reductions first. The Basin States have agreed to an operational framework on the River that reduces the risk of a shortage trigger; Arizona still takes the shortage first, but there are lower probabilities that it will occur. That's good news indeed to the more than 5 million people who rely on it in Maricopa, Pinal and Pima counties, as well as the River communities like Yuma, Lake Havasu and Bullhead City.

[5] www.supreme.state.az.us/wm/Default.htm accessed February 24, 2006.

In 2006, we are using fully our Colorado River allocation of 2.8 million acre-feet, but in different ways than we thought in 1987.

Arizona risked, in 1987, losing some of its Colorado River water because it was not being used. Recall only 335,000 acre-feet of CAP water was delivered that year, primarily for M&I purposes. While authorized in 1968 mainly as an agricultural water supply project, farmers mostly chose not to sign long-term contracts for CAP water, as it was cheaper to continue pumping groundwater. Litigation between the CAP and the federal government over the amount to be repaid for CAP also clouded the economics; one wasn't certain what the price of CAP water might be. With M&I uses about 20% of water consumption, prospects seemed dim for actually reversing the trend of agricultural mining of groundwater.

In response to this situation, of risk to the state's Colorado River allocation and continued groundwater pumping, the Legislature created, in 1996, an innovative tool for water management in the Arizona Water Banking Authority. The Bank, as it is called, created pricing incentives for farmers to take CAP water for the same cost as if they pumped, thereby "saving" the groundwater that would have been pumped. It also buys excess CAP water not being directly used and recharges it into AMA aquifers for later use.

In this way, the Water Banking Authority created the conditions necessary for one of my predictions to become true: groundwater recharge launched as a viable mechanism to store renewable supplies of water underground for future use. In 1987, one Underground

Savings Facility for direct recharge was planned: the Granite Reef Underground Storage Project, a joint effort among the SRP and several metropolitan Phoenix cities. In 2006, across the Phoenix, Pinal and Tucson AMAs, there are approximately 59 permitted underground storage facilities, where both CAP water and treated wastewater are directly recharged for future use, and 18 permitted Groundwater Savings Facilities, where CAP water is used in lieu of pumping. Through 2003, more than 3.6 MAF has been stored or saved as a result of Arizona's groundwater recharge programs. [6]

The Bank also has served a useful tool in Arizona's relationship with Nevada, as it stores Colorado River water underground in Arizona for that state. In 2001, the Bank agreed to recharge 1.2 MAF for the Southern Nevada Water Authority if sufficient excess Colorado River water was available. The cost for this service was limited to the actual cost of importing, recharging and recovering the banked water. In 2005, that agreement was amended so that Nevada would also pay the state an additional $100 million; in return, the Bank guaranteed the 1.2 MAF will be recharged. The Bank remains confident that surplus water will be available to meet this commitment while ensuring no Arizona user is harmed. The total cost to Nevada will be $330 million.[7]

The Bank is thus both an intrastate and interstate water banking institution, providing a mechanism to purchase excess water supplies and store them underground for future use.

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[6] Permitted Projects, June 30, 2005, www.azwater.gov/dwr/Content/Find_by_Program/Recharge/permitted_recharge_facilities.htm, accessed February 24, 2006; see also Arizona Water Banking Authority, Annual Plan of Operation, available at the Arizona Department of Water Resources; Worden, ed. Arizona's Water Future. p.211.

[7] Arizona Water Banking Authority, Fact Sheet: Arizona –Nevada Interstate Banking Agreement, February 28, 2006, author's possession.

Arizona has been a leader in managing its water resources conjunctively; that is, managing groundwater and surface water to ensure both supplies meet future needs. In 1987, we thought the Groundwater Management Act would herald a new era of sound water management. And it has. With fits and starts, it has achieved one of its goals – it makes people think twice about groundwater pumping. Using a variety of tools, including pump taxes, restrictions on new groundwater use, preventing new agricultural irrigation, mandatory conservation measures and a requirement for new development to demonstrate an assured water supply of renewable supplies for 100 years, the 5 Active Management Areas within Arizona have dramatically slowed the pumping of groundwater in our most populous areas. In particular, the initiation of the Assured Water Supply program in 1995, requiring a demonstration that a development will have a 100-year water supply, has done the most to provide incentive to use renewable water supplies and reduce groundwater pumping. Despite the tremendous growth in population, we are pumping less groundwater in 2006 than we did in 1987.[8]

In 1987, we assumed that reduction in groundwater pumping would occur because agriculture would diminish as urbanization marched onward across farmland. The water that had been used to nourish cotton and alfalfa would then be used to support homes and businesses. This would provide a natural "reallocation" of water from agricultural to urban uses. While much farmland has been developed within the AMAs, substantial

[8] Bruce A. Wright, ed., Ensuring Arizona's Water Quantity and Quality into the 21st Century, Phoenix: Arizona Town Hall, 1997, p. 49; AMA Water Budgets, www.azwater.gov/WaterManagement_2005/Content/AMAs/default.htm, accessed February 24, 2006. In the period 1986-1990, about 1.7 MAF was pumped from the Active Management Areas. In 2006, approximately 1.6 MAF was pumped.

agriculture remains. This does not mean that urbanization has slowed, quite the contrary. Development is occurring on virgin desert land, outside of established urban areas, due to creation of another water institution, the Central Arizona Groundwater Replenishment District. While also an innovation, its effect is perhaps both a blessing and a curse.

The Legislature created the Replenishment District, in 1993, to provide a mechanism for landowners and water providers to demonstrate an assured water supply. Under that program's rules, groundwater may not be the basis for any new development in Phoenix, Tucson and the Pinal AMAs. If a development does not have CAP water or other renewable supplies, it must pay to join the Replenishment District. The District, in turn, must recharge in each AMA the amount of groundwater pumped which exceeds allowable limits. In theory, this replenishment should balance groundwater withdrawals with deposits.

The Replenishment District is, however, more popular than initially envisioned. Its creation allows development of lands anywhere within the AMAs, as it provides for continued groundwater pumping for direct delivery; there is no constraint on a development's location based on the need for infrastructure to deliver or to legally obtain renewable supplies. The District's current projected water repayment obligations are 100 KAF in 2015 extending to 200 KAF in 2025. The District has plans to use excess CAP water through 2014, when it will need to add other significant supplies to its renewable water portfolio. The District's most recent plans to obtain renewable supplies include obtaining long-term Indian lease water, reclaimed water, imported groundwater, and land

fallowing agreements.[9] It has, however, no permanent supply of its own. Moreover, the water it has recharged for "deposit" has been in locations far from where it is "withdrawn", leaving open the possibilities for land subsidence as groundwater pumping continues. In fact, a central issue for recharge of water generally is the place and plan for recovery.

The District's challenges are many, including competition for these finite renewable supplies, which will be in demand as established water providers continue to seek new renewable supplies to sustain their 100 years water portfolios, and as communities outside AMAs begin their hunt for their next bucket of water. As well, the District will need to decide how many members it can possibly sustain over a 100- year period of time.

The most recent Arizona Town Hall on water, held in 2004, assessed the progress toward meeting the groundwater management goals underlying Arizona's AMAs and concluded that the goals and framework of the program remained sound. Based on today's rates of water consumption and pumping, however, we will not reach safe-yield in any of the AMAs by 2025, although Tucson may come the closest, where a conservation ethic is firmly rooted. Despite this, we are managing our water resources substantially better in our metropolitan areas through a variety of institutions and programs, with the regulatory ones perhaps having greater results.

[9] Central Arizona Groundwater Replenishment District, www.cagrd.com accessed February 27, 2006.

Water management is both a supply and demand side function: residential, industrial and agricultural conservation programs reduce the amount of water used while a focus on renewable supplies, such as reclaimed wastewater, CAP and other surface water and water harvesting efforts, work to increase the amount of water available. Water management is more art than science; one set of actions to reduce demand may have the unintended effect of also reducing supply of wastewater. The Groundwater Management Act has proven itself a worthwhile framework for Arizona's water policy, and as we've seen, significant progress has been made. Our ability to reach safe-yield, however, in a world of ever- increasing population and existing rights to pump groundwater, is unknown.[10]

Our urban water supplies are more robust than they were in 1987, but can we drink them? The quality of Arizona's groundwater, particularly underlying our metropolitan areas, was worrisome indeed in 1987. The Environmental Quality Act, which created in 1986 the Arizona Department of Environmental Quality and water quality programs like the Aquifer Protection Program and the Pesticide Contamination Prevention Program, focused our attention and invested substantial regulatory powers in the state to protect Arizona's groundwater for future drinking water use.

The 2005 WQARF Registry, the state's version of federal Superfund sites, showed 35 sites throughout Arizona in various stages of groundwater investigation or remediation, with an additional 9 federal Superfund sites and 12 Department of Defense sites. While Arizona has increased the number of Early Response Actions for contaminated sites,

[10] Worden, et al, Arizona's Water Future, pp. 82-3, 91.

actual groundwater cleanup has been slow, with treatment plants like the one in operation for the Town of Payson, actually removing PCE from the water supply, few in number. Monitoring of known sites continues, as does debate over likely remediation strategies for some of the largest and most difficult contamination plumes. The most effective remediation for these, such as the Phoenix West Van Buren plume, which stretches 10 miles from 7th Avenue on the east to 83rd Avenue on the west, between Van Buren Street on the north and Buckeye Road on the south, may be to do nothing, and provide water treatment only when it is pumped for use. Time and advances in technology often dictate what will eventually be viable remediation strategies.[11]

Since 1987, Arizona's regulatory efforts to manage environmental risk focus on preventing pollution from entering rivers, lakes and groundwater in the first instance. The water quality protection programs are intended, for the most part, to maintain currently existing water quality and prevent further degradation. As areas of groundwater contamination are discovered, they are evaluated for risk to public health, and then listed on the WQARF Registry for further investigation and development of remediation strategies. All these programs use a cost/benefit analytical framework to drive results, and are pragmatic in their implementation. This requires an often iterative approach that, while accepting some level of pollution as an inevitable result of a modern industrial

[11] Arizona Department of Environmental Quality, 2005 Water Quality Assurance Revolving Fund Registry, accessed October 10, 2005 at www.azdeq.gov/environ/wawaste/sps.html .

society, focuses on what is important to protect Arizona's waters for drinking, fishing and recreation and for the most part, keeps Arizona's water safe.[12]

Some of my 1987 predictions were right and some were really, really wrong! I was right on CAP, recharge of water, better management and planning, and water quality. I was wrong on price, marketing, and creating an environment with a more efficient allocation of resources. I was both right and wrong on water conservation!

Being wrong causes one to reflect on why: what didn't happen that would have caused my predictions to be correct. Why doesn't water cost more? In every water symposium that I attend, it is the rare occasion when participants don't pose this question. We live in a desert. Water is scarce. Why doesn't the market work for water as it does for gasoline? The short answer is, it probably does, but water is a long-term commodity and gasoline, a short-term one. The planning horizon for moving gasoline is based on weeks; for water in much of our state, it is 100 years. Prices move immediately when a gasoline pipeline breaks and supply is jeopardized. Here, in the midst of what could be the longest drought of record, the metropolitan areas are literally awash in water supplies. Water infrastructure is expensive and has a useful life of about 20 years. The metropolitan areas are currently in the midst of having to repair and replace water and wastewater treatment facilities, as well as miles of pipes and pumps. The costs of this work are in the billions of dollars. Water rates will rise to cover these expenses, but when they are spread among a million or more customers over a 20-year period, we don't notice them as we do a sudden

[12] Karen L. Smith and Charles G. Graf, "Arizona's Water Quality Challenges" in Bonnie Colby and Katherine Jacobs, eds., Water Management Innovations for Arid Regions. Arizona: Policy and Practice, forthcoming from Resources for the Future Press, October 2006.

rise in gasoline. Additionally, we treat water as a free commodity, charging only the cost to get it, treat it and deliver it, but not to replace it. Economists and policy makers continue to debate the use of price as a water management tool, but to date, cost has not been a significant reason behind any reduced use.

The fact that the price of water has remained relatively flat obviously discourages the kind of water marketing I thought might occur. The Chicago Board of Trade probably does not need to create a new trading pit for water commodities any time soon. We have seen some interesting innovations, though, in the Arizona Water Banking Authority. Rather than a spirited, free-market approach I thought might take place, instead a very focused, managed, centralized effort has occurred, where the State has assumed the role of purchasing excess supplies of Colorado River water for future use. Other Colorado River Basin states quieted the marketing fervor that existed in the late 1980s, when they crafted public policy that kept their water at home. So, why no marketing of water like we see with other scarce commodities? Price, is one reason. There's not a lot of quick money to be made. Public policy that recognizes the intrinsic relationship of certainty in water supplies with a state's economic prosperity, though, is probably the largest reason. There are some things we don't auction off to the highest bidder to be transported out of our state.

Water conservation has worked in part; we have reduced our water use over 1987 levels, although perhaps not as much as we should. The Groundwater Management Act places some mandatory conservation requirements on municipal providers, on agriculture and

industrial uses not served by a municipal provider within AMAs, but our ability to actually measure results is limited. In 1987, I thought we would see a greater requirement to reduce our water use with measurable results. That has not happened yet, although in 2006 there are many programs in place to encourage it.

Our legal framework for water in Arizona provides long-term certainty of the right to use water by establishing a system of surface and, within AMAs, groundwater rights. That same framework works against a more efficient reallocation of the right to use water to changing needs and values. For example, our surface water right framework is based upon the doctrine of prior appropriation, first in time is first in right to use the water. Beneficial use is the measure of the right, but it is not prioritized against other uses. We don't consider whether one use is more valued than another; just which use is first in time. This can cause conflict, for example, between those who have the right to use water to grow what might be low-value crops and those who would like to restore riparian conditions, leaving water in a river instead of taking it out. I thought in 1987 we would need to address our 19th century legal framework for water for the 21st century. That has yet to happen. But it is possible that it won't need to happen, at least in the way I initially thought. Creation of new institutions, like the Water Bank and the Replenishment District, and the creative use of water exchanges and transfers, may allow us the flexibility to make our 19th century laws work for our 21st century values.

What can we expect for our centennial in 2012? I titled this talk *Arizona's Crucible* because a definition of crucible as a severe test or trial seems very appropriate as it relates

to water, growth and the future of our arid state. Arizona has done well since 1987 in developing a water management and policy framework to serve our metropolitan areas and those areas included within the Groundwater Management Active Management Areas. If in 1987 we worried about water supplies for our growing urban population, we worry now about the rural parts of our state. Instead of the urban/agriculture conflict we envisioned in the 1980s, we face an urban/rural conflict, where the state's surface water, including the Colorado River, is largely dedicated to metropolitan Phoenix and Tucson. The groundwater resources in places like Payson, Sierra Vista, Flagstaff and Mohave County are insufficient to support higher rates of growth and development. Where will these growing communities find the water resources necessary to sustain that growth?

We know that the San Pedro River is at risk from over-pumping, and the future of keeping open Fort Huachuca near Sierra Vista appears to rely on maintaining a sustainable water supply. The Upper San Pedro Partnership is comprised of federal and state agencies, county and local governments, environmental and development organizations, all focused on finding a solution to this complicated water problem. They do not rule out securing an allocation of CAP water and spending hundreds of millions of dollars to deliver it to the area. They do not rule out looking for an appropriate regulatory framework.

Each day the newspaper reports other developments planned on tremendous scale. If all the planned developments in Mohave County were to occur, we would be looking at the creation of new communities with a population greater than exists today in Lake Havasu,

Bullhead City and Kingman combined. We're skeptical there are sufficient water supplies to sustain that level of growth there for 100 years. Other communities outside the AMAs are trying to find additional water supplies to support their growth. The Town of Payson now has access to some surface water at the Blue Ridge Reservoir, but it will be expensive to transport it. The City of Flagstaff has just purchased a large ranch overlying the C aquifer, and its water future involves pumping and piping that water back to the city, again at what will be tremendous expense.

Finding the right tools to help rural communities manage water supplies and appropriate growth is a significant issue for Arizona, while avoiding a situation where the water "haves" do battle with the water "have nots."

If you read the papers you also know that we are experiencing a record number of days without any rainfall, telling us that the wet weather we had last winter was just a blip in what has been a long period of drought. We've experienced drought before, but there is something about this one that makes us all a little nervous. We are seeing effects of climate change, and the relationship between that and water supplies is now a topic of substantial research. This issue is obviously the proverbial "elephant in the room", as sustained drought, earlier and longer wildfire seasons, and warmer temperatures are just some of the potential effects. We need to understand it and we will need to address it.

Water quality remains an ongoing issue because of a simple truism: if you look for it, you will find it. Advances in laboratory technology and analytical techniques allow us now to

find contaminants at very low levels. While we understand what to do about the alphabet soup of contaminants we found in 1987, we are unsure of the health effects of endocrine disruptors and other pharmaceutical compounds; viruses like *Naegleria fowleri* and *Norovirus;* and other contaminants in wastewater that we don't know about today, but will need to use for tomorrow's water supplies.

In some ways we end where we began: debating how, and when, and why we should work to reach safe yield in our use of groundwater supplies. We are nearing the juncture where we will need to make some tough choices if we agree that safe yield by 2025 remains our goal. Or perhaps we will conclude safe yield remains our goal but at some date later than 2025. Other issues will arise to take the place of the ones we think we solve. At their base will be questions of cost and equity.

Much has changed since I talked in 1987 about Arizona water issues, but fundamentally, nothing is different. We live in a desert. Water is scarce. We'll always worry about it. What has changed dramatically is the way we researched this talk today, compared to 1987. Back then, there was no "internet" to speak of; research was done the old fashioned way, books, folders, paper, all "touched" and collected through some card index. When Sarah and I did this paper, we worked nearly entirely off the Internet and it raised some questions for us as we approach the Centennial: what happens to reports and records after they are removed from a website? I'd like to think they are safely filed somewhere, but I'm not certain. More and more agencies are "imaging" records. How can we make sure they are searchable, with an index? I'm an unusual policymaker, with a PhD,. in history; I

think about keeping records. But even I am unsure if we are successfully maintaining a record, in any medium, so that we are providing for historical continuity. What about electronic communications? How are we “archiving” these? When someone sits and writes the water story in 2012, how will we make sure they have the necessary information, in an accessible way?

As a water policymaker, I look forward to rolling up my sleeves and engaging in the vigorous debate about tools and strategies to solve our water problems, and the consequences of doing nothing. We look back to help us look forward. I am hopeful that through your hard work, we’ll be able to continue to rely on history as a guiding principle.